

## **EXPERIMENT OPERATION TIMELINE**

### **( ACTIVE EXPERIMENTS ONLY)**

Power to the module system will be turned on several hours after launch by Astronaut command. Following activation, the MEU in each module will follow its unique experiment program to activate control functions and acquire data samples as a function of time. Analog circuitry and the 5.00 volt Sensor Power will only be turned on during sampling of data to conserve power.

The experimenter generated timeline data is uploaded to the flight MEU. Only four simple commands are currently possible: turn on (SET) a power line, turn off (RESET) a power output, and begin sampling a data channel at one of the allowed sampling rates. Sampling of a data channel can be stopped by setting its sample rate to zero.

The experiment clock is started at the time the experiment system is turned on by the astronaut crew and increments at one (1) second intervals. Experiment time is specified as days, hours, minutes, and seconds since turn-on. Time range is 00D 00H 00M 00S to 19D 23H 59M 59S. Successive times in the timeline file must be the same or greater than previous statements.

Power outputs are designated +12 PWR 1 to +12V PWR 9. A set (SET) command turns on the specified output to allow power to flow to the experimenter components connected to that output. The power remains on until reset (RESET) command is sent. The output current on +12 PWR 1 can be up to 5A. All other power outputs must be limited to loads the draw less than 1A. At no time may the experiment draw more than 5A. A total of 60W-hrs of power is available the each module. The less current consumed, the longer the experiment may run. The ground software will help determine if this limit has been exceeded.

Data sampling for the various data channels is initially set to zero or no sampling. A rate (RATE) command sets the sample rate for the specified channel which is then sampled at the specified rate until the rate is set again. Each data sample requires two bytes in the data storage memory. The ground software will check the specified timeline to insure that data memory capacity will not be exceeded.

Data channels:

<b><i>Channel (Dec.)</i></b>	<b><i>Channel (HEX)</i></b>	<b><i>ANALOG CHANNEL</i></b>	<b><i>Analog Signal Pin #s</i></b>	<b><i>Analog Return Pin #'s</i></b>
0	0	External Thermistor #1	11	30
1	1	External Thermistor #2	12	31
2	2	External Thermistor #3	13	32
3	3	External Analog #1 (0 to +5 V)	14	33
4	4	External Analog #2 (0 to +5 V)	15	33
5	5	External Analog #3 (0 to +5 V)	16	33
6	6	External Analog #4 (0 to +5 V)	17	33
7	7	External Analog #5 (0 to +5 V)	18	33
8	8	External Analog #6 (0 to +5 V)	19	33
9	9	Not Used (Connected to ground)	-	-
10	A	Not Used (Connected to ground)	-	-
11	B	External Current	Internal	-
12	C	MEU +12V (SEM Battery)	Internal	-
13	D	MEU +5V Power Supply	Internal	-
14	E	+5V Sensor Power (10 mA max.)	34	33
15	F	MEU Thermistor (YSI 44006)	Internal	-

Data sample rates:

<i><b>Rate #</b></i>	<i><b>Rate ID</b></i>	<i><b>Description</b></i>	<i><b>Samples/Hour</b></i>
0	ZERO	No Sampling	0
1	ONCE	Sample Once	-
2	10MIN	Sample Every 10 Minutes	6
3	5MIN	Sample Every 5 Minutes	12
4	1MIN	Sample Every 1 Minutes	60
5	10SEC	Sample Every 10 Seconds	360
6	5SEC	Sample Every 10 Seconds	720
7	1SEC	Sample Every 10 Seconds	3600
8	0.2SEC	Sample Every 10 Seconds	18000

Timeline command statements in the experiment data file will have the format shown below. A comment can be provided on each line. Software will prompt the experimenter to enter the timeline data, insert the data into the format shown, and perform checks on entries. Software will also compute energy usage, and memory usage, and will flag any attempt to exceed the allowable parameters.

<i><b>Day</b></i>	<i><b>Hour</b></i>	<i><b>Min.</b></i>	<i><b>Sec.</b></i>	<i><b>Command</b></i>	<i><b>Port</b></i>	<i><b>Rate</b></i>	<i><b>Comment</b></i>
00D	00H	00M	00S	SAMPLE	THERM 3	10MIN	Sample themperature.
00D	00H	00M	00S	SAMPLE	MEU 12V	1SEC	Sample battery voltage
00D	00H	50M	25S	SET	Port 1		Turn on solenoid valve
00D	02H	17M	34S	RESET	Port 1		Turn off solenoid valve
00D	02H	17M	34S	SAMPLE		ZERO	Stop sampling
00D	02H	17M	34S	SAMPLE	MEU 12V	ZERO	Stop sampling

## **SEM EXPERIMENTER SOFTWARE**

The SEM experimenter software will be available at no cost to anyone wishing to design a SEM experiment. The software is designed to run on a PC type computer running Microsoft Windows 3.1x or Windows 95. A preliminary version of the software is available by anonymous FTP at:

[sspp.gsfc.nasa.gov/pub/software/ file: semxx.zip](ftp://sspp.gsfc.nasa.gov/pub/software/file:semxx.zip)

where xx is the version number.

The SEM software performs the following functions:

The Experiment Data File Editor will allow entry and editing of the various parts of the Experiment Data File (EDF) which includes narrative data, timeline, electrical information, parts list, and materials list. Printed reports can be made of each section.

The Experiment Data File Analyzer reads a completed or partly completed EDF and generates a printed report. The analyzer flags missing data, determines the electrical power and energy required by the timeline, and determines the amount of data memory consumed. Plots can also be made of power and energy vs time and the times that various outputs are “on”.

The Module Operations Program will download the timeline data to a flight or ground version of the SEM module processor. Following a ground test run or flight the program will upload the measurement data and create a Measurement Data File.

The Measurement Data Processor program will read data from a Measurement Data File and produce a variety of printed plots and tabular lists of flight or test data.